



07-038

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sdayton@swcp.com; EPA Edward Padilla; Helen Maestas; Rep Gail Chasey; AttyGen NM Gary
King
Subject: Nickel Contamination at Sandia National Laboratories Mixed Waste Landfill

January 24, 2007

Ron Curry, Secretary
New Mexico Environment Department
PO BOX 26110
Santa Fe, New Mexico 87502

RE: Nickel Contamination at the Sandia National Laboratories Mixed Waste Landfill. Citizen Action request that 1) fines and RCRA compliant groundwater monitoring be immediately implemented and that 2) RCRA compliant groundwater monitoring wells be installed at the MWL.

Dear Secretary Curry,

The attached report presents findings by Mr. Robert Gilkeson, Registered Geologist, that the nickel wastes buried in the mixed waste landfill (MWL) are responsible for the nickel contamination measured in groundwater below the MWL. The nickel contamination measured in water samples collected from the monitoring well have increased ten-fold since the first samples were collected. **The nickel contamination is double the New Mexico drinking water standard.**

The position by Sandia/DOE and NMED that the nickel contamination is caused by corrosion of the stainless steel well screen is technically incorrect and without basis to the water quality data.

Citizen Action is asking that the NMED take prompt action as required under RCRA to correct this situation. **The situation is analogous to that of Los Alamos National Laboratories which detected and failed to report a hexavalent chromium plume.** The NMED properly fined LANL for the failure to report the chromium contamination.

The nickel contamination is statistically significant evidence of contamination at the MWL under the Resource Conservation and Recovery Act. 40 CFR 264.98 (f).

Sandia has a duty under RCRA to notify the NMED within seven days of statistically significant contamination. Sandia has instead waited years, and misinterpreted the data so as to claim that it is due to corrosion of the stainless steel well screen at MW1 when the proportion of chromium is so low as to negate that excuse.

Sandia also has a duty to “Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of appendix IX of part 264 are present, and if so in what concentration.” 40 CFR 264.98 (g)(2). In fact, there are no monitoring wells at appropriate locations to monitor the uppermost aquifer at MWL in order to protect Albuquerque’s drinking water.

We realize that the NMED Hazardous Waste Bureau has taken the incomprehensible legal position that requirements of 40 CFR Subpart F do not apply to the monitoring wells at the MWL. (NMED Responses to Citizen Comments). We would suggest that the NMED position is in itself a violation of RCRA and of the Consent Order which NMED, Sandia and DOE signed. Also, the fact that NMED views the MWL under Corrective Action has no effect to remove the monitoring well system at Sandia from compliance with Subpart F.

Sincerely,

David B. McCoy, Executive Director
Citizen Action New Mexico
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Albuquerque, NM 87196
505 262-1862

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Nickel Contamination in the Regional Aquifer From Nickel Wastes Buried in the Sandia Mixed Waste Landfill, Version January 23, 2007
by Robert H. Gilkeson, Registered Geologist rhgilkeson@aol.com

The Moats report – *Evaluation of the Representativeness and Reliability of Groundwater Monitoring Well Data, Mixed Waste Landfill, Sandia National Laboratories* (NMED, November 2006), relies on the findings in Goering et al. (SAND 2002-4098) that the elevated nickel levels measured in well MW1 are due to corrosion of the stainless steel well screen. However, this finding in Goering et al. is technically incorrect and without basis to the water quality data collected over time from the well. In fact, the high dissolved nickel measured in water samples produced from well MW1 is because of the nickel wastes that are buried in the mixed waste landfill.

The nickel contamination measured in water samples produced from well MW1 are summarized below in Table 1. The location of well MW1 is shown on Figure 1. The Moats report does not acknowledge that nickel wastes were disposed of in the MWL. Page 4 of the Moats report describes the contaminants measured in boreholes drilled below the MWL as follows:

“Based on analysis of soil samples from investigational boreholes as well as passive and active soil-gas surveys (SNL, 09/1996), detectable contaminant releases from the MWL are limited to low levels of tritium, radon, and volatile organic compounds in the vadose (*i.e.*, unsaturated) zone. Cadmium has been detected at low concentrations in the vadose zone, but only along the western boundary of the landfill.”

In fact, the Moats report does not acknowledge the nickel contamination that was measured in boreholes drilled below the dump as shown by the concerns in the NMED 1998 Notice of Disapproval (NOD) for the *“Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation.”* The NMED NOD described the presence of elevated nickel concentrations to a depth of 100 ft below ground surface (bgs) and a “hot spot” of nickel contamination at a measured level of 97.5 mg/kg at a depth of 50 ft bgs in borehole BH-3. The NMED NOD made the following conclusion:

“The presence of metal contaminants at depths which can exceed 100 ft indicates that liquid wastes were disposed of in the landfill. Thus, groundwater monitoring for metals is required.”

The stainless steel screen in well MW1 is Type 304 stainless steel and is composed of 18% chromium and 8% nickel. Corrosion of the well screen will provide both chromium and nickel to the groundwater. However, the very high levels of dissolved nickel and very low levels of dissolved chromium are evidence that the nickel contamination is not from corrosion of the screen. The water quality data for well MW1 are presented below in Table 1 for the 15-year period from 1990 to 2005. Over this period, the dissolved nickel has increased from 43 ug/L in 1990 to 405 ug/L in 2005. The highest dissolved nickel value of 538 ug/L was in a water sample collected in 1998.

The dissolved chromium values are very low in well MW1. Dissolved values between 11 and 21 ug/L are reported for four water samples collected in 1991 but this data is uncertain because chromium was not detected (*i.e.*, < 10 ug/L) in the unfiltered water samples collected as splits of the filtered samples. For water samples collected over the period from 1997 to 2005, the dissolved chromium levels are very low with the highest value of 4.22 ug/L measured in a water sample collected in 1999. The most recent water sample analyzed for dissolved chromium was in 2000 with a measured estimated value of 2.39 ug/L compared to a measured value of 8.67 ug/L for chromium in an unfiltered split of the water sample. Note that for the April, 2005 sampling event, a very low estimated chromium level of 1.05 ug/L was measured in an unfiltered water sample compared to an unfiltered value of 411 ug/L for nickel and a filtered value of 405 ug/L for nickel.

The close comparison of nickel values in the unfiltered and filtered splits is evidence that the high dissolved nickel values are from buried wastes in the MWL. Corrosion would create finely divided particles of nickel and result in a markedly higher value for nickel in the unfiltered water sample.

The water quality data collected from well MW1 support the conclusion that the high dissolved nickel values are because of groundwater contamination by nickel wastes released from the Sandia Mixed Waste Landfill. The failure of the Moats report to identify the presence of nickel contamination in well MW1 is another example of the poor quality of the report.

The NMED has allowed Sandia to collect water samples from well MW1 with the inappropriate high-flow purging methods that pump the well dry with water samples collected a week later of the aerated water that refilled the well. At the time of construction, well MW1 was adequately productive to support a low-flow water sampling methodology as shown by the fact that the permeability of the screened interval was measured with a pumping test.

The 20-ft. screen in well MW1 is in the depth interval of 456 to 476 ft below ground surface (bgs). During the 2006 sampling event, the water level was measured at a depth of 467.62 ft bgs.

The borehole log describes the aquifer strata across the well screen as follows:
467 - 472 ft bgs GM – silty sandy gravel; predominantly fine gravel with a trace of clay.
472 – 479 ft bgs. SM – silty fine sand, trace clay.

The borehole log predicts the saturated strata across the screened interval have a capability to produce a continuous flow of water for low-flow purging and sampling. The 2006 field sampling log on file at NMED shows that the well was purged at a rate of 2.3 liters per minute, a purging rate 10 times faster than the rate recommended by EPA and NMED for low-flow sampling.

The purge to dry sampling methodology used for routine collection of water samples from well MW1 may be masking detection of other contaminants in the groundwater. It is important to use a low-flow sampling methodology for the collection of water samples from well MW1. In fact, it is very probable that the purge to dry sampling methodology has caused the formation of a new mineralogy in the strata surrounding the screened interval that have properties to mask the detection of contaminants in the groundwater produced from the well. In addition, the purge to dry sampling methods may have caused physical processes that have lowered the hydraulic conductivity (Ksat) of the screened interval. It may be necessary to perform well development procedures to improve the ability of the well to produce water for low-flow purging and sampling.

The damage caused to monitoring wells by high-flow purging is described on page 3 of the NMED Position Paper – *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (October, 2001):

“High Flow Rate Sampling: Evacuation of water from the screened interval of a monitoring well at a rate that significantly exceeds natural flow through the screen (Barcelona, Wehrman, and Varljen, 1994) or the groundwater flow velocity for which the well was designed. High pumping rates of groundwater from the monitoring well may cause undue stress on the well screen or sand pack, shorten the usability and life span of the well, cause excessive turbidity, or may cause other damage to well construction.”

Drinking Water Standards for Nickel. The New Mexico Water Quality Standard for nickel is that concentrations shall not exceed 200 ug/L. The EPA remanded the nickel drinking water standard Maximum Contaminant Level (MCL) of 100 ug/L on February 9, 1995, and has not issued a new MCL.

The nature and extent of nickel contamination in the groundwater below the mixed waste landfill is poorly understood at the present time because of the insufficient number of monitoring wells and the inappropriate methods that are used for the collection of water samples.

For water samples collected from the upper screen in monitoring well MW4, the NMED water quality data base lists anomalously high dissolved nickel values of 31.9 and 32.2 ug/L for splits of water samples collected on April 16, 2003. A much lower nickel value of 15.9 ug/L was measured in an unfiltered water sample collected on April 20, 2004, and an even lower value of 4.5 ug/L was measured in an unfiltered water sample collected from well MW4 on April 19, 2005.

An elevated nickel value of 69.4 ug/L was measured in an unfiltered water sample collected from well MW3 on April 22, 2003. The high turbidity of 11 NTUs measured in this water sample may be responsible for the high nickel value. For this sampling date, nickel was not analyzed for a filtered water sample. The overall poor quality of the groundwater monitoring data for the mixed waste landfill prevent knowledge of the danger of groundwater contamination now and in the future from the buried wastes.

Table 1. Constituents Measured in Water Samples From Well MWL-MW1

- Drill Method – Air Rotary Casing Hammer with no drilling fluids other than water
- Well has a Type 304 stainless steel screen

Sample Date	Nickel ^B	Turbidity NTU ^F	Chromium ^C		Iron		Zinc ^D		Chloride mg/L ^G	Nitrate mg/L
	ug/L ^E		U	U / F	ug/L	U / F	ug/L	U / F		
- 09-90	46 / 43	NA ^J	ND ^K <10 / ND<10		NA		NA		31.0	NA
- 01-91	NA	NA	ND < 10 / 21		?		NA		29.9	NA
- 05-91	NA	NA	ND < 10 / 15		?		NA		NA	NA
- 07-91	NA	NA	ND < 10 / 11		?		NA		NA	NA
- 10-91	NA	NA	ND < 10 / 19		?		NA		28.2	5.5
- 07-92	150 / 63	NA	11 / ND < 10		?		21 / NA		NA	NA
- 01-93	78 / NA	NA	11 / NA		NA / 90		ND<20 / ND<20		NA	NA
- 04-93	97 / 94	NA	ND<10 / ND<10		118 / NA		11 / NA		31.0	5.5
- 11-93	95 / NA	NA	10 / NA		220 / NA		16 / 16		29.1	5.4
- 05-94	150 / NA	NA	ND < 10 / NA		110 / NA		17 / 17		NA	5.0
- 05-94	130 / NA	NA	ND < 10 / NA		48 / NA		16 / 16		NA	5.0
- 10-94	100 / NA	NA	ND < 10 / NA		58 / NA		28 / NA		30	5.2
-10-94	130 / NA	NA	ND < 10 / NA		ND < 100 / NA		24 / NA		NA	5.2
- 04-95	120 / NA	1.4	ND < 3 / NA		94 / NA		4.4 / 4.4		31.9	5.5
-10-95	107 / NA	7.2	42.8 / NA		565 / NA		6.73 / 6.73		29.5	NA
- 04-96	145 / NA	3.8	11.6 / NA		?		6.36 / 6.36		NA	5.2
- 04-97	NA	18.9	1,100 / NA		NA		NA		NA	5.2
-10-97	NA	4.9	47.4 / 1.94 (j) ^L		NA		NA		NA	5.1
-10-97	NA	NA	40.5 / 2.07 (j)		NA		NA		NA	5.1
- 04-98	398 / 538	7.1	326 / ND < 0.73		NA		NA		NA	5.4
- 04-98	500 / NA	NA	260 / NA		NA		NA		NA	5.4
-11-98	490 / 467	6.1	69.4 / 0.32 (j)		NA		NA		NA	5.4
- 04-99	266 / 313	6.8	63.4 / 4.22		583 / 111		ND<7.88 / NA		NA	5.2
- 04-00	279 / 281	3.2	8.67 / 2.39 (j)		960 / NA		ND< 46 / NA		NA	4.4
- 04-01	252 / NA	7.4	34.9 / NA		409 / NA		25.7 / NA		31.1	3.0
- 04-02	265 / NA	NA	17.6 / NA		272 / NA		58.7 / NA		31.2	4.8
- 04-03	374 / NA	3.4	14.1 / NA		464 / NA		NA		32.4	4.7
- 04-04	401 / NA	6.6	42 / NA		886 / NA		17 / NA		32.6	5.2
- 04-05	411 / 405	6.4	1.05 (j) / NA		697 / 135		11.1 / 5.13		32.3	3.2
- 04-06	NR ^M	14	NR		1,650 / NA		NR		NR	NR

^A Values listed in the table are from DOE/SNL reports and data on file at the NMED.
^B NMED recognizes a nickel concentration of 28 ug/L to be representative of natural background,
^C NMED recognizes a chromium concentration of 43 ug/L to be representative of natural background,
^D NMED recognizes a zinc concentration of 260 ug/L to be representative of natural background,
^E ug/L = micrograms per liter or parts per billion.
^F NTU = nephelometric turbidity units – a measure of the amount of suspended material in water samples.
^G mg/L = milligrams per liter or parts per million.
^H T = listed value is from a measurement on an unfiltered water sample.
^I D = listed value represents dissolved constituents as water was filtered with a 0.45-micron filter membrane.
^J NA = water sample was not analyzed for the listed constituent.
^K N.D. = listed constituent was not detected in water sample, < value = limit of detection.
^L (j) = listed value is an estimate,
^M NR = measured value was not reported in the data on file at the NMED.

Figure 1. Monitoring Wells at the Mixed Waste Landfill.

